IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Application No.	:	09/477,365	Confirmation No.: 9145
Applicant	:	W.S. Lai	
Filed	:	January 4, 2000	
Group Art Unit	:	2661	
Examiner	:	S. Blount	
Docket No.	:	1999-0492	
Title	:	UPSTREAM BANDWIDTH ALLOCATION FOR PACKET TELEPHONY IN A SHARED-MEDIA PACKET-SWITCHED ACCESS NETWORK	

Commissioner for Patents
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APPEAL BRIEF

I. Real Party In Interest

The real party in interest in this appeal is AT&T Corp., the assignee of the entire right, title and interest to this invention as per the Assignment and Agreement recorded in the United States Patent and Trademark Office at Reel/Frame 010515/0331.

II. Related Appeals and Interferences

There are no other prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. Status of Claims

Claims 1- 35 were originally filed in this application. Claims 29-35 were cancelled without disclaimer or prejudice in a Response to Election/Restriction Requirement under 35 U.S.C. §121 filed June 3, 2003. Claims 2, 14-17 and 19 were cancelled in an Amendment dated October 27, 2003. Claims 1, 3-13, 18 and 20-28 are currently pending in this application. All pending claims stand rejected. The rejection of all pending claims is appealed. Pending claims 1, 3-13, 18 and 20-28 are included in the Claims Appendix of section VIII.

IV. Status of Amendments

No amendment has been filed subsequent to the final rejection.

V. Summary of Claimed Subject Matter

The present invention is related to a technique for reducing jitter in a bi-directional cable-access system. One of the problems with upstream channel communications in a cable-access system is illustrated in Figs. 4A and 4B of the present application and described in the specification at page 7. As shown in Figs. 4A and 4B, and the accompanying description in the specification, jitter occurs as a result of shifting time slots within a nominal grant interval. More particularly, Fig. 4A shows three voice connections, each being carried by a particular time slot. If one of the voice connections is terminated, one of the time slots is dropped, and the remaining connections are shifted to the remaining two time slots, as illustrated in Fig. 4B. However, as a result of this shift, voice packets of the remaining connections are not received at their expected time, which leads to so-called jitter, or packet delay variation, and an accompanying degradation of service. The

present invention solves this problem by establishing jitter windows within the voice region of a transmission frame so as to maintain the packet delay within an acceptable tolerance.

Independent claim 1 is directed to a method of reducing the above described jitter problem. As set forth in claim 1, packets are transmitted in an upstream channel in a frame, with the frame comprising one or more voice regions having fixed size. Further, the voice regions are further divided into jitter windows, with each of the jitter windows comprising a plurality of time slots for carrying voice packets. This three tiered hierarchy for a frame (i.e., voice region, jitter window, time slots) is illustrated in Fig. 2A of the present application. The jitter windows are established such that the packet delay variation, or jitter, of the calls being transmitted within each of the jitter windows is maintained within an acceptable tolerance when voice packets associated with a call are shifted between time slots.

Independent claim 9 is directed to a method of allocating a new upstream channel to accommodate a new voice connection where a current upstream channel is carrying one or more existing voice connections. An Immediate Upstream Channel Change (IUCC) (as described in conjunction with Fig. 5 at pages 4-5 of the specification) is a procedure in which a cable modem carrying one or more voice calls may switch to another channel to carry the voice calls. Claim 9 is directed to a method for performing a channel change while reducing jitter. In accordance with claim 9, a new channel is selected, where the new channel has at least one idle time slot to accommodate a new voice connection in addition to the existing voice connections. In order to reduce jitter, voice packets from the existing voice connections maintain jitter window assignments in the new channel corresponding to the jitter window assignments in the old channel. In this way, jitter is reduced during the switch to the new channel.

Independent claims 18 and 28, while different in certain respects, are generally directed to shared-media packet-switched access networks which are designed to reduce the above described jitter problem. As set forth in these claims, packets are transmitted in frames, with the frames comprising at least one

voice region having fixed size. Further, the voice regions are further divided into jitter windows, with each of the jitter windows comprising a plurality of time slots for carrying voice packets. This three tiered hierarchy for a frame (i.e., voice region, jitter window, time slots) is illustrated in Fig. 2A of the present application. The jitter windows are established such that the packet delay variation, or jitter, of the calls being transmitted within each of the jitter windows is maintained within an acceptable tolerance when voice packets associated with a call are shifted between time slots.

VI. Grounds of Rejection to Be Reviewed on Appeal

The grounds for rejection presented for review are:

1. Are claims 1, 3-11, 13, 18 and 20-28 unpatentable under 35 U.S.C. 103(a) over "Applicants Admitted Prior Art" ("AAPA") in view of U.S. Patent No. 5,841,777 (Cohen) and U.S. Patent No. 6,697,435 (Anderlind et al.)?
2. Is claim 12 unpatentable under 35 U.S.C. 103(a) over AAPA in view of Cohen and Anderlind et al., and further in view of U.S. Patent No. 5,295,140 (Crisler, et al.)?

VII. Argument

1. Claims 1, 3-11, 13, 18 and 20-28 are patentable under 35 U.S.C. 103(a) over AAPA in view of Cohen and Anderlind et al.

a. Claims 1, 18 and 28

Claim 1 contains the limitations of a frame "comprising one or more voice regions" and "at least two non-overlapping jitter windows in said one or more voice regions" with "each of said at least two jitter windows comprising a plurality of time slots". Thus, claim 1 clearly claims voice regions, which are divided into jitter windows, which are further made up of time slots. Thus, claim 1 clearly and distinctly claims a three part frame hierarchy, which is shown, for example, in Fig.

2A of the present application. This three part frame hierarchy of voice regions, jitter windows and time slots is missing from the cited art.

The most recent Office Action admits that the AAPA does not disclose this frame architecture, and relies solely on the Cohen reference as disclosing these claim limitations. The frame in Cohen, as seen in Figure 4 of Cohen, only contains a two part frame hierarchy. The frame (e.g., frame 3 401-3) is made up of ABR region 407-3 and CBR region 409-3 (see col. 8, lines 57-65). The ABR region of Cohen corresponds to Applicant's data region and the CBR region of Cohen corresponds to Applicant's voice region (see col. 1, lines 60-64). Thus, Cohen discloses a voice region (409-3) which comprises time slots (406-3, 403'-2, 405'-2). However, Cohen is lacking the intermediate grouping of jitter windows, which is specifically claimed in claim 1.

This distinction may be illustrated using the following table which shows a possible correlation of the Cohen frame and a frame in accordance with the present invention:

PRESENT INVENTION (as shown in Fig. 2A)	**COHEN** (as shown in Fig. 4)
Voice and Data Regions	CBR region (409-3) and ABR region (407-3)
Jitter Windows	*Missing*
Time slots	Time Slots (406-3, 403'-2, 405'-2)

Thus, while the present invention establishes and defines jitter windows within the voice region, there are no such jitter windows in Cohen. Thus, Cohen fails to disclose the three part frame hierarchy as claimed in claim 1.

Independent claims 8 and 18 contain limitations similar to claim 1 with respect to the three part frame hierarchy and are allowable for the same reasons as discussed above in connection with claim 1.

The fact that Cohen is missing jitter windows as discussed above is not surprising because Cohen has no need for jitter windows. As discussed above, the jitter window in accordance with the present invention is used so that when a call connection is shifted between time slots, such shifting will remain within an assigned jitter window, and as such, the packet delay variation is limited by the size of the jitter window. Thus, the jitter window is used to reduce the jitter problem when a call connection is shifted from one time slot to another. Cohen does not need to address this time slot shifting problem because Cohen assigns sub-channels for the duration of the call, and is therefore not concerned with shifting time slots (Cohen at col. 9, lines 32-35). Since channels are assigned for the duration of the call, there is no shifting to different channels and therefore the problem of jitter does not arise and is therefore not addressed.

Each of the jitter windows in accordance with the claimed invention comprises a plurality of time slots for carrying voice packets. When the time slot carrying a particular call shifts to a different time slot, jitter is limited by shifting to a time slot within the previously assigned jitter window. Claims 1, 18 and 28 claim this aspect of the invention by the claim limitation of "when voice packets associated with a call are shifted between time slots"

The Office Action states that "Cohen teaches grouping constant bit rate and available bit rate data into separate groups ..." and then makes the conclusory statement that "[i]t would have been obvious ... to have established 'jitter windows' to the voice regions of AAPA, in light of the teachings of Cohen,... in order to help prevent jitter". However, this statement of obviousness is unsupported by the actual teachings of Cohen for the reasons discussed above. Further, there is no problem of jitter in Cohen, and therefore no reason "to help prevent jitter".

It is noted that the Office Action also states that "applicant has defined a jitter window as "[b]y splitting the voice region into two approximately equal non-overlapping windows, and maintaining calls associated with the same SID within the same jitter window, jitter is limited to the duration of the jitter window" (page

13, lines 7+)". This portion of the specification describes one advantageous use of jitter windows in order to reduce jitter but does not necessarily define the term 'jitter window".

b. Claim 9

As described above, independent claim 9 is directed to a method of allocating a new upstream channel to accommodate a new voice connection where a current upstream channel is carrying one or more existing voice connections.

Claim 9 contains limitations specifically directed to the time slot shifting problem discussed above. Claim 9 contains the limitations of:

> selecting a new upstream channel with at least one idle time slot to accommodate said at least one new voice connection and said one or more existing voice connections,
>
> assigning time slots in said new upstream channel to carry voice packets generated from said new and existing voice connections, such that voice packets from said one or more existing voice connections maintain jitter window assignments in the new upstream channel corresponding to the jitter window assignments in the current upstream channel.

Cohen has no disclosure of selecting a "new upstream channel" and assigning time slots in this new upstream channel "such that voice packets from said one or more existing voice connections maintain jitter window assignments in the new upstream channel corresponding to the jitter window assignments in the current upstream channel." Thus, claim 9 is also allowable over Cohen et al. for this reason. In rejecting claim 9, the Office Action cites the AAPA and makes the conclusory statement that "it would be obvious to one of ordinary skill in the art maintain the jitter window assignments between the new upstream channels and the current upstream channels in order to maintain the advantages of having the SID's grouped together...". This statement is not supported by the cited art.

Independent claim 9 also contains the limitation of "one or more jitter windows comprising a plurality of time slots for carrying voice packets", which is not disclosed by Cohen for reasons similar to those discussed above in section

VII.1.a. in connection with Claims 1, 18 and 28. The Office Action states that "Cohen teaches grouping constant bit rate and available bit rate data into separate groups ..." and then makes the conclusory statement that "[i]t would have been obvious ... to have established 'jitter windows' to the voice regions of AAPA, in light of the teachings of Cohen, in order to help prevent jitter". However, as discussed above, this statement of obviousness is unsupported by the actual teachings of Cohen. There is no problem of jitter in Cohen, and therefore no reason "to help prevent jitter".

c. Claims 3 and 20

Claims 3 and 20[1] are dependent upon an allowable independent claim, and are therefore also allowable. Claims 3 and 20 add additional allowable subject matter as follows.

Claims 3 and 20 are directed to a method and network, respectively, in which the length of the jitter windows are established in a particular manner as claimed. The Office Action cites no art that discloses this particular manner of establishing the length of the jitter windows, but merely states that is it obvious. Applicant submits that there has not been a showing of obviousness with respect to claims 3 and 20.

d. Claim 5

Claim 5 is dependent upon an allowable independent claim, and is therefore also allowable. Claim 5 adds additional allowable subject matter as follows.

Dependent claim 5 adds the limitation that the jitter windows are established in one voice region. The Office Action cites no art that discloses this particular manner of establishing the jitter windows, but merely states that is it obvious. Applicant submits that there has not been a showing of obviousness with respect to claim 5.

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[1] It is noted that the Examiner provides no specific reasons for rejecting dependent claims 20-27 other than "see the rejection of claim 1". For clarity of arguments, Applicant discusses certain of these dependent claims with claims having related limitations for which the Office Action did provide more detailed rejections.

e. Claims 10 and 24

Claims 10 and 24 are dependent upon an allowable independent claim, and are therefore also allowable. Claims 10 and 24 add additional allowable subject matter as follows.

Dependent claims 10 and 24 are directed to a particular technique for selecting an upstream channel in accordance with certain criteria. In rejecting claim 10, the Office Action relies on "maintaining correspondence between the connections in the jitter windows" makes obvious "having the number of idle time slots be the same between the current and new upstream channels". The Office Action fails to cite any prior art which discloses "maintaining correspondence between the connections in the jitter windows" and therefore reliance on this statement for a rejection is improper. This statement is a conclusory statement based on the Examiner's rejection of claim 9, but it is not prior art, and it is therefore an improper basis for rejection.

f. Claims 11 and 21

Claims 11 and 21 are dependent upon an allowable independent claim, and are therefore also allowable. Claims 11 and 21 add additional allowable subject matter as follows.

Claims 11 and 21 are directed to a particular technique for selecting a new upstream channel. The Office Action cites Cohen at col. 9, lines 14+ as disclosing "packed with first fit." However, the cited section of Cohen discloses adding time slots to a region and does not render obvious selecting a new upstream channel as claimed.

g. Claims 4, 6, 7, 8, 13, 23, 25, 26 and 27

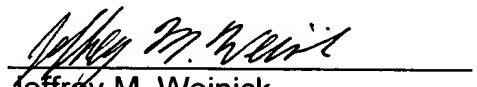
Claims 4, 6, 7, 8, 13, 23, 25, 26 and 27 are dependent upon allowable independent claims and are therefore also allowable.

2. Claims 12 and 22[2] are patentable under 35 U.S.C. 103(a) over AAPA in view of Cohen and Anderlind et al., and further in view of Crisler, et al.

Claims 12 and 22 are dependent upon an allowable independent claim, and are therefore also allowable. Claims 12 and 22 add additional allowable subject matter as follows.

Claims 12 and 22 are directed to a particular technique for assigning a time slot. The Office Action cites Crisler et al. without any particular reference. Assuming that the Office Action is relying on the same section of Crisler et al. as in prior Office Actions (i.e., at col. 6, lines 65+) as disclosing random time slot assignment, Applicant argues that the cited section of Crisler et al. discloses waiting for the occurrence of a random access time slot on an inbound communication channel. Waiting for a random access time slot is not the same as randomly assigning an idle time slot. As such, Crisler et al. does not render claims 12 and 22 obvious.

Respectfully submitted,



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[2] Applicant notes that claim 22 was rejected under 35 U.S.C. 103(a) over AAPA in view of Cohen and Anderlind et al., and as such could be discussed in section VII.1. However, due to the similarity of claimed subject matter between claims 12 and 22, these claims are being discussed together under section VII.2.

VIII. Claims Appendix

1. A method of reducing jitter in a shared-media packet-switched access network offering integrated Internet Protocol voice and data services comprising the steps of:

transmitting packets in an upstream channel in a frame, said frame comprising one or more voice regions having fixed size;

establishing at least two non-overlapping jitter windows in said one or more voice regions, each of said at least two jitter windows comprising a plurality of time slots for carrying voice packets, and said at least two jitter windows collectively covering the entire one or more voice regions; and

wherein said jitter windows are established such that packet delay variation of calls being transmitted within each of said jitter windows is maintained within an acceptable tolerance when voice packets associated with a call are shifted between time slots.

3. The method of claim 1 wherein said step of establishing at least two non-overlapping jitter windows in said one or more voice regions further includes:

establishing two jitter windows,

where *n* is the number of time slots in said one or more voice regions, defining the length of each of said two non-overlapping jitter windows as *n*/2 for an even number of time slots in the voice region, or

for an odd number of time slots in said one or more voice regions, defining the length of one non-overlapping jitter window as (n-1)/2, and the length of the other jitter window as (n+1)/2.

4. The method of claim 1 wherein said shared-media packet-switched access network is connected to a distribution plant comprising one of hybrid fiber-coaxial, coaxial, or fiber-to-the-curb.

5. The method of claim 1 wherein said jitter windows are established in one voice region.

6. The method of claim 1 wherein said jitter windows are established in two voice regions separated by a data-only region.

7. The method of claim 1 wherein said step of establishing at least two non-overlapping jitter windows further includes:

establishing more than two non-overlapping jitter windows.

8. The method of claim 7 wherein the lengths of each of said more than two non-overlapping jitter windows are approximately equal.

9. A method of allocating a new upstream channel to accommodate at least one new voice connection in a shared-media packet-switched access network

offering integrated Internet Protocol voice and data services, wherein a current upstream channel is carrying one or more existing voice connections, each of said existing voice connections being assigned to one or more jitter windows comprising a plurality of time slots for carrying voice packets, said method comprising the steps of:

selecting a new upstream channel with at least one idle time slot to accommodate said at least one new voice connection and said one or more existing voice connections,

assigning time slots in said new upstream channel to carry voice packets generated from said new and existing voice connections, such that voice packets from said one or more existing voice connections maintain jitter window assignments in the new upstream channel corresponding to the jitter window assignments in the current upstream channel.

10. The method of claim 9 wherein said new upstream channel is selected such that,

(1) the number of idle time slots in each jitter window in said new upstream channel being no less than the number of idle time slots allocated to a corresponding jitter window in said current upstream channel accommodating existing voice connections, and

(2) at least one of the jitter windows in said new upstream channel accommodating voice packets from said new and existing voice connections.

11. The method of claim 9 wherein said step of selecting a new upstream channel further includes selecting one of a packed with first fit, minimally packed or maximally spread upstream channel.

12. The method of claim 9 wherein said step of assigning time slots further includes assigning an idle time slot for said new voice connection by selecting one of a lowest idle time slot, a highest idle time slot or randomly selecting an idle time slot.

13. The method of claim 9 wherein said voice connections are constant-bit-rate voice connections.

18. A shared-media packet-switched access network offering integrated Internet Protocol voice and data services comprising:

a cable modem located at a customer-end of an access network;

a cable modem termination system located at a head-end of an access network;

at least one upstream channel for transmitting voice and data packets from said cable modem to said cable modem termination system; wherein

said packets are transmitted in a frame comprising at least one voice region having fixed size, wherein said at least one voice region comprises at least two non-overlapping jitter windows, and wherein each of said at least two jitter

windows comprises a plurality of time slots for carrying said voice packets, and said at least two jitter windows collectively covering the entire voice region; and

wherein said jitter windows are configured such that packet delay variation of calls being transmitted within each of said jitter windows is maintained within an acceptable tolerance when voice packets associated with a call are shifted between time slots.

20. The network of claim 18, wherein said frame comprises two non-overlapping jitter windows in two voice regions, *n* being the number of time slots in the voice region, defining the length of each of said two non-overlapping jitter windows as *n*/2 for an even number of time slots in the voice region, or

for an odd number of time slots in the voice region, defining the length of one non-overlapping jitter window as (*n*-1)/2, and the length of the other jitter window as (*n*+1)/2.

21. The network of claim 18, wherein said cable modem termination system assigns said at least one upstream channel to said cable modem by selecting one of a packed with first fit, minimally packed or maximally spread upstream channel.

22. The network of claim 18, wherein said cable modem termination system selects one of a lowest idle time slot, a highest idle time slot or randomly selecting an idle time slot to carry said voice packets.

23. The network of claim 18, wherein said cable modem termination system assigns a new upstream channel, with at least one idle time slot, to said cable modem when said at least one upstream channel cannot accommodate a new voice connection from said cable modem.

24. The network of claim 23, wherein said cable modem termination system selects said new upstream channel based on the following:

(1) the number of idle time slots in each jitter window in said new upstream channel being no less than the number of idle time slots allocated to a corresponding jitter window in a current channel accommodating existing voice connections, and

(2) at least one of the jitter windows in said new upstream channel can accommodate voice packets from said new and existing voice connections.

25. The network of claim 18, wherein said access network includes one of hybrid fiber coaxial, coaxial or fiber-to-the-curb.

26. The network of claim 19, wherein said at least two non-overlapping jitter windows includes more than two non-overlapping jitter windows.

27. The network of claim 26, wherein the lengths of each of said more than two non-overlapping jitter windows are approximately equal.

28. A shared-media packet-switched access network offering integrated Internet Protocol voice and data services comprising:

at least one upstream channel for transmitting voice and data packets to said cable modem termination system; wherein

said packets are transmitted in frames comprising at least one voice region having fixed size, wherein said at least one voice region comprises two non-overlapping jitter windows collectively covering said voice region, each of said two jitter windows comprising a plurality of time slots for carrying voice packets; and

wherein said jitter windows are configured such that packet delay variation of calls being transmitted within each of said jitter windows is maintained within an acceptable tolerance when voice packets associated with a call are shifted between time slots.

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None